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(54) Paint dispensing apparatus

Vorrichtung zum Verteilen von Farben

Appareil pour le dosage des peintures

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Description**Background Of The Invention****1. Field Of The Invention**

[0001] The present invention pertains to apparatus for dispensing pulverulent materials such as tinted coating materials, food supplements and perfumes, and more particularly to such apparatus used for making a blended composition using components taken from a plurality of supply canisters.

2. Description Of The Related Art.

[0002] Automated and semi-automated dispensing apparatus has been employed for some time in a variety of important commercial endeavors, in response to a growing preference in the paint and coatings industry to reduce inventory of premixed blended compositions. Rather, it is preferred that automated or semi-automated dispensing apparatus be relied upon to provide the necessary ingredients according to a predefined formula or recipe. Examples of such apparatus are found in United States Letters Patent Nos. 4,967,938, 5,078,302, 5,193,720, 3,851,798, 5,305,917, 5,361,812, 5,368,196, 5,328,057, 5,407,100 and 5,119,973. WO-A-94/21554 discloses a dispensing apparatus having the features which are indicated in the preamble of claim 7.

[0003] Despite continual improvements in automated dispensing apparatus, further refinements are still being sought. For example, certain materials require periodic cleaning of the dispensing equipment. Advances in reducing the amount of cleaning time, the amount of labor or the level of skill required for such cleaning are still being sought.

[0004] In addition, manufacturers of the dispensing equipment are seeking ways of reducing production costs, as well as reducing the time required for producing automatic dispensing products. Reduction in time required to produce automated dispensing apparatus not only results in labor savings, but allows the manufacturer of such equipment to quickly meet customer orders.

[0005] One competing consideration which sometimes outweighs a drive for further reductions in fabrication costs is a customer's insistence that equipment be made as compact as possible. For example, it is commonplace in the paint coatings industry to have as many as sixteen similarly sized canisters mounted on a turn-table. The canisters contain recipe ingredients to be dispensed according to preselected formulas. Paint coatings and their recipe ingredients oftentimes tend to settle over time and accordingly it has been found necessary to keep the ingredients stored in the canisters in suspension, ready for a subsequent dispensing operation. Because of customer's demands for compact equipment, the storage canisters are oftentimes located close to one another, complicating design and as-

sembly methods required to produce a commercial product having effective canister stirring features. Advances in the art are still being sought which satisfy not only customer's demands for compactness, but also allow a manufacturer of automated dispensing apparatus to enjoy reduced fabrication costs and assembly times.

[0006] In order to reduce product costs, automated dispensing apparatus typically employs a common actuator mechanism for operating a plurality of dispensing pumps. In the machines referred to above, the canisters are made to pass across the common actuator, with a desired canister being selected and stopped in position in anticipation of engagement by the actuator mechanism. In order to maintain control over dispensing accuracy, it is important that the actuator mechanism be shielded from unintentional contact which might cause the mechanism to come out of a precise calibration, while at the same time it is important that the actuator mechanism be made available for routine inspection, replacement of worn parts and calibration checks. These operations are particularly important where a user of such automated dispensing apparatus changes the types of materials being dispensed. Those familiar with the paint coatings industry, for example, have noted the increased rate of changes of coating formulations. A potential need arises, for each change in paint coating formulations, and particularly with changes in paint coating materials, that access to the actuator mechanism be readily gained, to perform all necessary calibration checks and adjustments.

Summary Of The Invention

[0007] It is an object of the present invention to provide automated dispensing apparatus having a common actuator for dispensing materials from a plurality of storage canisters.

[0008] Another object of the present invention is to provide such apparatus with a dispensing actuator which is readily accessible for service operations, and which can be readily withdrawn from the storage canisters to allow better access for cleaning storage canisters, and to prevent unintentional contamination of the actuator mechanism.

[0009] A further object of the present invention is to provide apparatus of the above-described type in which the dispensing actuator mechanism is mounted on a service door so as to allow ready access to the dispense actuator mechanism, and to facilitate removal of the mechanism, if necessary. Such construction, if properly employed, could also result in cost savings for manufacturers of automated dispensing apparatus, allowing the manufacturers to fabricate the actuator mechanism as a separate sub-assembly on a bench top environment.

[0010] A further object of the present invention is to provide an improved framework for mounting the service door carrying the dispense actuator mechanism,

consistent with increasing customer demands for greater dispense accuracies.

[0011] Yet another object of the present invention is to provide automated dispense apparatus having a plurality of storage canisters carried on a common turntable, the turntable being rotated to present a desired canister to a dispensing station.

[0012] A further object of the present invention is to provide such apparatus having improved canister positioning, insuring desired alignment of a selected canister at the dispensing station.

[0013] Another object of the present invention is to provide such automated dispensing apparatus having means for supporting the turntable against distorting forces experienced during a dispense operation. For example, when dispensing of larger quantities of materials is required, use of larger dispensing pumps can be expected. Such pumps require increased support for the canisters and their associated turntable because of the greater mechanical forces associated with larger pump size. Also, in the paint coatings industry, for example, there is a trend to concentrate the materials to be dispensed in a given recipe. One result of such trend, is that the dispensing materials are becoming increasingly difficult to pump, typically requiring greater pump force to complete a dispensing operation. A turntable, which can otherwise be constructed of light weight material so as to attain weight and cost savings, may have to be reinforced or made more massive to successfully withstand the greater pump forces experienced in the dispensing apparatus.

[0014] It is an object of the present invention to provide a cost effective strengthening reinforcement for the turntable, without requiring complicated structures or increasing the mass of the turntable.

[0015] These and other objects according to the principles of the present invention are provided in dispensing apparatus for dispensing a plurality of pulverulent materials, according to claim 1.

[0016] Preferred embodiments of the invention are indicated in the dependent claims.

Brief Description Of The Drawings

[0017]

FIG. 1 is a perspective view of dispensing apparatus according to principles of the present invention; FIG. 2 is a front elevation view thereof; FIG. 3 is a side elevation view thereof; FIG. 4 is another side elevation view thereof, taken from the opposite side; FIG. 5 is a bottom plan view thereof; FIG. 6 is a rear elevation view thereof; FIG. 7 is a top plan view thereof; FIG. 8 is an exploded perspective view of the framework portion thereof; FIG. 9 is a fragmentary top plan view thereof, with

the top cover removed;

FIG. 10 is a top plan view thereof with the top cover shown partly broken away;

FIG. 11 is a fragmentary perspective view thereof, shown partly broken away;

FIG. 12 is a cross-sectional view taken along the line 12-12 of FIG. 11;

FIG. 13 is a top plan view showing the drive plate thereof;

FIG. 14 is a cross-sectional view taken along the line 14-14 of FIG. 13;

FIG. 15 is a view similar to that of FIG. 13 but showing an alternative drive plate arrangement;

FIG. 16 is a fragmentary elevation view of the drive plate assembly taken along the line 16-16 of FIG. 15;

FIG. 16a is a fragmentary elevation view of the crank rods used in the embodiment of FIGS. 15 and 16;

FIG. 17 is a front elevation view of the service door assembly;

FIG. 18 is a side elevation view thereof;

FIG. 19 is a rear elevation view thereof;

FIGS. 20 and 21 are fragmentary view of FIG. 19, showing subsequent stages of operation;

FIG. 22 is a fragmentary cross-sectional view taken along the line 22-22 of Fig. 19;

FIG. 23 is a top plan view thereof;

FIG. 24 is a front elevation view of a guide block portion thereof;

FIG. 25 is a side elevation view thereof;

FIG. 26 is a top plan view thereof;

FIG. 27 is a fragmentary perspective view of the pump actuator assembly portion of the dispensing apparatus; and

FIGS. 28-30 are side elevation views thereof showing the sequence of operation thereof.

Detailed Description Of The Preferred Embodiments

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[0018] Referring initially to Figs. 1-7, paint dispensing apparatus according to principles of the present invention is generally indicated at 10. Apparatus 10 includes a generally cylindrical canister housing 12 mounted on a base 14. A door 16 is hinged at its right-hand side to a door frame member 18 (see Fig. 3). An opposing door frame member 20 (see Fig. 4) cooperates with door 16 to seal mechanism behind the door, as will be seen herein. Referring to Figs. 1 and 2, the container-receiving cavity 22 is formed by sidewalls 24, 26, a rear wall 28 and a floor 30. Preferably, the sidewalls 24, 26 are supported by door frame members 18, 20, while floor 30 extends beneath base 14 as can be seen, for example, in Fig. 8.

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[0019] Referring now to Fig. 8, supporting framework construction is generally indicated by 36. In addition to the aforementioned floor 30, framework construction 36 includes front and rear internal walls 38, 40, internal side

walls 42 and upright pillars comprising the door frame members 18, 20. Several exterior panels complete the support construction. For example, top wall 46 is mounted atop door frame members 18, 20 and is preferably permanently secured thereto. Taken together members 46, 18 and 20 comprise a door frame assembly which surrounds the opening in canister housing 58. Further, side wall panels 50, 52 are removably secured to their underlying internal wall members, by conventional fasteners. As can be seen in Fig. 8, the internal supporting walls 48-42 have relatively large openings, affording ready access to equipment located within the cabinet work.

[0020] Referring to Fig. 1, the canister housing 12 includes a generally cylindrical side wall 58, a cover 60 which (referring additionally to Fig. 7) is hinged at 62 and 64 for opening of access doors 66, 68 so as to gain access for filling canisters located within housing 12. If desired, the doors 66, 68 could be combined into a single door.

[0021] Referring now to Fig. 9, a fragmentary cut-away view of apparatus 10 is shown. Canister housing 12 includes a floor 70 (which can also be seen in the bottom plan view of Fig. 5). A plurality of canister assemblies 72 are mounted on a platform or turntable 74. Referring to Fig. 14, the canister assembly 72 include a plurality of stirring blades 76 mounted on a common stirring rod 78 having a crane-like structure at its bottom end 80. In the preferred embodiment, canister assemblies 72 preferably comprise commercially available canister and plunger assemblies Model Nos. 7187, 7188, 3816, 3817 and 3836 for the manual dispensers offered for sale by the assignee of the present invention under the model designation "Blendorama". Canister assemblies described in commonly assigned U.S. Patent No. 4,781,312 could also be used.

[0022] Referring again to Fig. 9 and Fig. 14, apparatus 10 includes a stirrer drive plate 84 which is generally star-shaped, having a plurality of outwardly radiating fingers 86 defining a plurality of gaps 88 between the fingers. As can be seen in Fig. 14, bottom ends 80 of steel rods 78 are received in the apertures 90 of stir drive plate 84. If desired the plate 84 could be solid and uninterrupted, i.e., a circular disk without fingers.

[0023] Referring again to Fig. 14, a conventional bi-directional electric drive motor 94 having an output shaft 96, is mounted to bottom wall 70. A conventional one-directional coupling (or bearing) 98 couples motor outward shaft 96 to turntable 74 and to a crank arm 102 having a spindle 104 received in an aperture 106 (see Fig. 13) forming the central portion of stir drive plate 84.

[0024] As can be seen in Fig. 13, aperture 106 is formed slightly off center of plate 84. Accordingly, as crank arm 102 is rotated about the axis of motor outward shaft 96, plate 84 is made to sweep an eccentric orbit. As a consequence, the apertures 90 formed in the fingers 86 of plate 84 are also made to sweep respective eccentric orbits causing stir rod 78 to rotate about their

longitudinal axes, thus driving stir blades 76 within the canisters.

[0025] As mentioned, coupling 98 is a conventional one-directional coupling which provides drive power to both turntable 74 and crank 102 only when motor 94 is energized so as to rotate in a first direction. As motor 94 is energized to rotate in an opposite direction, drive power is applied to crank 102. To rotate the table for stirring, turntable 74 is disconnected by the function of coupling 98. As indicated in Fig. 14, a window 110 is formed in the bottom of the canister so as to allow the entry of finger 86 of drive plate 82 so as to engage the bottom end 80 of stir rod 78. The cross-sectional view of Fig. 14 shows the bottom end of the canister resting on the turntable 74 while allowing engagement of the drive plate and stir rod.

[0026] Referring to Fig. 10, it can be seen that the canister assemblies 72 are spaced relatively close together, making it difficult to drop the canister assemblies into position during assembly of the dispensing apparatus. In order to alleviate these problems of assembly, an alternative embodiment of the dispenser apparatus is provided, as shown in Figs. 15 and 16. The arrangement shown in Figs. 15 and 16 differs from that already described, only with reference to the stir drive mechanism. Referring now to Fig. 15, the same stir drive plate 84 is employed, but is modified, in that a pair of holes 106 are formed in the plate interior. In the embodiment shown in Figs. 15 and 16, the motor 94 drives a timing belt 114 which in turn drives a pair of cranks 102. The timing belt maintains the cranks in synchronism, but still the drive plate 84 is made to sweep an eccentric orbit with the alternative arrangement. An advantage, however, is that the stir rod 78 need no longer be located in apertures

90 formed in fingers 86. Rather, pins are inserted in the apertures 90 so as to extend upwardly above fingers 86. The crank rods 78 are modified to have lower free ends which are horizontally extending (see FIG. 16a). The lower ends 80 of stir rods 78 are located in the gaps 88 formed between fingers 86. The pins in fingers 86 engage the lower ends 80 of stir rods 78, again causing the stir rods to rotate about their central axes, driving stir blades 76 within the canisters. Ease of assembly of automated dispensing apparatus 10 is significantly improved in that the stirring rods of the canister assemblies need not be accurately positioned at the time of insertion so as to insure passage of the lower stir rod ends 80 within stir drive plate apertures 90.

[0027] Referring again to Fig. 9, automated dispensing apparatus 10 includes a service door assembly generally indicated at 120, located interiorly of outer door 16. In the preferred embodiment, both outer door 16 and interior service door assembly 120 are hinged to door frame 18 by separate, but closely spaced hinges 122, 124, respectively. As will now be appreciated that the service door assembly 120 is shielded from outside contamination, including any spillage that might occur in the container-receiving cavity 22. If desired, doors 16, 120

could be combined to form a single, common assembly. [0028] Referring briefly to Figs. 27-30, the canister assemblies 72 include a single action piston pump assembly generally indicated 130 and including a piston pump shaft 132 which is movable within the pump in the manner indicated in Figs. 28-30. In place of a manually graspable handle provided in the conventional pump assemblies, a washer 134 is mounted above the pump shaft 132. A valve mechanism 136 is located beneath the piston pump, and includes an inlet connection to the interior of the storage canister, while the outlet of the valve allows dispensed material to be discharged in a downward direction, into the container receiving cavity 22. When employed for dispensing paint coating ingredients, an open top container of paint base material is typically located in container receiving cavity 22, in order to receive ingredients dispensed from selected canister assemblies positioned above the container-receiving cavity.

[0029] As mentioned, the canister assembly 72, dispenser pumps and valves 136 are all of conventional construction. The valves 136 are preferably operated in two positions, the first being a closed position, but with the pump chamber opened to the canister interior allowing materials to be withdrawn from the interior of the canister, into the pump chamber, with the height of the pump shaft 132 controlling the amount of materials withdrawn into the dispense pump. The valve 136 is then moved to the second operating position to open the pump chamber to an outlet port located at the bottom of the valve, and to close off communication between the pump interior and the canister interior.

[0030] In operation of the canister assembly, the pump shaft 132 is first raised and lowered while an operating handle 138 located on the bottom of valve assembly 136 is moved (with reference to viewing the pump assembly from the front) left to right and back again in a generally horizontal plane. As will be seen herein, separate automated actuator systems are employed to operate the pump and valve components of canister assemblies 72. In order to provide a common frame of reference for actuator movement and to alleviate problems arising from three-dimensional alignment of the actuator systems, both actuator systems are mounted in a common service door assembly.

[0031] Referring now to Figs. 17-23, the service door assembly 120 includes a door plate 142 which (from a point of view taken outside of the dispensing apparatus) is hinged at the right-hand side, by hinge 124, as shown in Fig. 17. As mentioned, hinge 124 is secured to the door frame. The opposing side edge 144 of door panel 142 is removably secured to the door frame with removable fasteners, such as turn bolts or screws. A mounting plate 146 having the first portion of generally-trapezoidal cross-section, is received in a central aperture 148 in plate 142. Sides of mounted plate 146 are secured to plate 142 by screw fasteners 150, as can be seen in Fig. 17. As can be seen in Fig. 17, a vertically elongated slot

152 is formed in central wall portion 154 of mounting plate 146.

[0032] Referring now to the side elevation al view of Fig. 18 (taken from the left-hand side of Fig. 17) plate 146 includes an outwardly turned lip 156 at its upward end. The service door assembly 120 includes a plurality of sensors for sensing the position of various components associated with a dispensing operation. For example, a sensor having an electrical lead 158 is mounted in the bottom central portion of mounting plate 146. Preferably, the sensor is inserted through an aperture formed in the service door, so as to have its active service end looking toward the interior of the canister housing. Similarly, sensors having electrical leads 160, 162 are mounted just below the mounting panel 146. Preferably, they are inserted in an auxiliary mounting panel 146 which is suspended from the central portion 154 of mounting plate 146. The sensors having electrical leads 160, 162 are also "forward looking", that is, have their active service ends looking toward the interior of the canister housing. The sensors preferably comprise induction sensors, but other conventional sensors, such as photosensors or magnetic switching sensors, could also be employed.

[0033] As can be seen at the bottom of Fig. 17, a lower auxiliary mounting plate 166 is secured by screw fastener plate 142. As can be seen, for example, in Fig. 27, the lower auxiliary mounting plate 166 is not planar, but rather has a major body portion 170 received in an aperture 172 in plate 142 so as to be disposed at an acute angle to the plane of plate 142. A valve actuating motor 174 has an electrical lead 176 which passes through a grommet 178 received in mounting plate 166. The valve actuator motor 174 drives a gear box 176 having an output shaft on which a timing plate 180 is mounted (see Fig. 27, for example).

[0034] A sensor 182 has an electrical lead 184. The sensor is mounted in a manner similar to that indicated above, being inserted in a grommet 186 installed in mounting plate 166, so as to be "forwardly looking" into the interior of the canister housing. Preferably, the electrical lead 176 contains sufficient electrical conductors to control motor 174 to limit the amount of travel in both directions of rotation. Travel of the timing plate 180 in response to energization of valve actuating motor 174 is illustrated, for example, in Figs. 19-21. It is generally preferred that the sensor 182 be employed to control energization of motor 174 limiting its travel of each direction of rotation.

[0035] Timing plate 180 carries a generally L-shaped actuator arm 188 which engages valve operator arm 138, in the manner indicated, for example, in Fig. 27. Referring additionally to Figs. 19-21, as timing plate 180 is moved in the direction indicated in Fig. 20, the operating arm 138 is moved from its rest or fully closed position illustrated in Fig. 27 in a generally horizontal plane toward the hinged side 124 of mounting plate 142 which it faces. Preferably, the valve operating arm 138 is

spring loaded for return to the rest position indicated in Fig. 27. Accordingly, as timing plate 180 is moved in the direction indicated in Fig. 21, actuator arm 188 retreats to the position indicated in Fig. 19, allowing the valve operator arm 138 to return to the fully closed position illustrated in Fig. 27.

[0036] With reference to Fig. 19, initially the sensor 182 is covered, indicating to valve actuating motor 174 that rotation should be carried out in the direction indicated in Fig. 20 to prepare valve 136 for an intake of material from the canister to the dispensing pump cylinder. The intake of material corresponds to the sequence of operations shown in Figs. 28 and 29. When the pump cylinder is filled with the desired amount of material, the valve operator arm 138 is moved an additional mount to prepare for dispensing of the metered material, corresponding to the action indicated in Fig. 30.

[0037] Upon completion of a dispensing operation, the timing plate 180 is moved in a direction indicated in Fig. 21, to resume its rest or home input position illustrated in Fig. 19, corresponding to the position illustrated in Fig. 27. In a simple control scheme, the optical sensor 182 can be wired into the motor lead 176 to directly control application of electrical power to motor 174. However, if desired, a conventional motor control circuit or micro computer controller or the like can be employed, if desired. As will be seen herein, the computer control of the metering pump is preferred to achieve a high level of dispense accuracy and accordingly the control of motor 174 is carried out via the computer controller so that proper operating conditions of all major parts of the dispensing apparatus can be monitored and displayed to a user of the equipment.

[0038] Referring now to Figs. 17-30, a pump actuator assembly is generally indicated at 200. Referring briefly to Fig. 27, assembly 200 includes a conventional, bi-directional stepper motor 202 coupled to a threaded shaft 204, and a guide block 206 which is threadingly engaged with shaft 204 so as to travel along shaft 204 in upward and downward directions as indicated in Figs. 29 and 30. Referring to Fig. 18, motor 202 is secured at the upper end of mounting plate 146. As can be seen, for example, in Fig. 22, upward shaft 208 of motor 202 is coupled to the upper end of threaded shaft 204 by a conventional coupling member 210. Shaft 204 is supported at its upper and lower ends by conventional bearing members 212, 214.

[0039] Referring now to Figs. 24-26, guide block 206 is preferably formed by machining a monolithic block of Delrin plastic or other low friction material. The forward end 216 is milled to form a forwardly opening groove 218 having large funnel-like end portions 220, 222. An aperture 224 is formed in block 206 (see Fig. 26) to receive a bearing race 226. The bearing race 226 has a threaded interior bore 228 for mating with shaft 204. The bearing race is held in place with fasteners 230. As can be seen in Fig. 26, block 206 is machined to form a guide peg 232 which is received in slot 152 of plate 146 (see

Fig. 17). Accordingly, as motor 202 is energized to rotate in opposite directions, guide peg 232 travels in slot 152 maintaining a desired alignment, such that the slot 218 opens toward the center of turntable 74. Thus, as turntable 74 is rotated, a plurality of canister assemblies and their associated washers 134 pass through guide block 206, in the manner indicated in Fig. 27.

[0040] When a desired canister assembly approaches dispensing station 240 (see Fig. 9) located immediately in front of pump actuator assembly 200, rotation of the turntable is slowed in preparation for positioning the washer 134 of the selected canister assembly in guide block 206. In a preferred embodiment, the control components of the dispensing assembly are coupled to a micro-computer 244 located in the cabinet base 14, as indicated in Fig. 8. For example, as indicated in Fig. 14, control wiring 246 for drive motor 94 is routed to controller 244 to control selection of operation between the turntable and stirring elements, and when turntable operation is selected, to control rotation and angular position of the turntable. Accordingly, controller 244 is able to sense when a desired canister assembly is approaching the dispense station 240.

[0041] In the preferred embodiment, the turntable is constructed of lightweight materials. Nonetheless, there is a considerable mass carried by the turntable, represented, in part, by the various canister assemblies, including their associated dispense pumps and valves in addition to materials loaded in the canisters. In order to insure precise stopping of the turntable, at least one electromagnet 248 is mounted on bottom wall 70 (see Figs 11 and 12) so as to be positioned immediately adjacent the bottom surface of turntable 74. Under command of controller 244, magnet 248 is energized, effectively stopping further rotation of turntable 74, thus bringing the desired canister assembly to rest at dispensing station 240. The electromagnet is preferably located adjacent the dispense station so that it can be energized during pump operation to prevent the turntable from being pulled up and also from being pushed down. If desired, the controller 244 can be operated to reduce rotational speed of the turntable before the electromagnet is energized. Further, the current applied to the electromagnet can be increased either step-wise or in a smooth-curve fashion during a braking action. For example, a preliminary, reduced braking force can be applied before final stages of a braking action.

[0042] As indicated in Fig. 19, dispense pump actuator motor 22 is connected through cable 250 to controller 244. As also indicated in Fig. 19, the electrical lead 176 for dispense valve actuator motor 174 and electrical leads 184 for the aforementioned sensors are also coupled to controller 244. Accordingly, as mentioned, controller 244 is able to direct turntable drive motor 94 and electromagnet 248 to position the canister assembly at the dispense station, as mentioned. Further, controller 244 initiates a sequence of events for carrying out a dispensing operation. As mentioned, washer 134 is

brought into engagement with guide block 206. Under command of controller 244, motor 200 is energized to raise guide block 206 in the manner indicated in Figs. 28 and 29 so as to withdraw a preselected amount of material from the canister into the pump chamber. Thereafter, valve motor 174 is energized so as to rotate arm 188, moving the dispense valve arm 138 to an open position. This corresponds to displacement of arm 188 from the position shown in Fig. 19 to the position shown in Fig. 21. Accordingly, with the dispense valve in an open position, motor 200 is then energized for rotation in an opposite direction, lowering guide block 206 as indicated in Fig. 30, to dispense the contents of the pump chamber, thus completing dispensing of the chosen ingredient. The dispense cycle is repeated for the number of ingredients required until the dispensing operation is complete.

[0043] As will now be appreciated, the service door carries sensitive equipment which can be adversely affected by contamination, such as that associated with filling and cleaning the storage canisters. In such instances, the service door can be easily swung out of the way to remove its equipment from the contamination site. Further, with the service door withdrawn, a fairly large opening is provided for carrying out cleaning and other maintenance operations in the turntable area. Further, with the sensitive equipment mounted on a service door, the door can be removed for offsite maintenance, adjustments and calibration. Also, the service door and its components can be built and tested on a bench, in the first instance.

[0044] The drawings and the foregoing descriptions are not intended to represent the only forms of the invention in regard to the details of its construction and manner of operation. Changes in form and in the proportion of parts, as well as the substitution of equivalents, are contemplated as circumstances may suggest or render expedient; and although specific terms have been employed, they are intended in a generic and descriptive sense only and not for the purposes of limitation, the scope of the invention being delineated by the following claims.

Claims

1. Dispensing apparatus (10) for dispensing a plurality of pulverulent materials, comprising:

a plurality of canisters (72) for storing materials to be dispensed;
a dispensing station (240) whereat the materials are dispensed;
a plurality of metering pumps (130), associated with respective ones of said plurality of canisters (72) for receiving materials therefrom, the metering pumps (130) including pump operators (132,134) for dispensing preselected

amounts of materials withdrawn from the canisters (72);

a movable platform (74) for supporting the plurality of canisters (72) and for presenting preselected ones of the plurality of canisters (72) to the dispensing station (240);
a frame (36) supporting the platform (74);
pump actuator means (200,206) for engaging the pump operators (132,134) and for actuating the pump operators (132,134) to selectively withdraw and dispense preselected amounts of materials from the canisters (72);

characterized in that

a door (120) at the dispensing station (240) is hingedly supported by the frame (36,18); and
the pump actuator means (200,206) is carried on the door (120).

2. The apparatus of claim 1 further comprising a plurality of valves (136) associated with respective ones of said plurality of canisters (72) for controlling the flow of materials therefrom, the valves (136) including valve operators (138) for moving the valves (136) between closed and open positions.
3. The apparatus of claim 1 further comprising valve actuator means (180, 188) carried on the door (120), for engaging the valve operators (138) to selectively move the valves (136) between closed and open positions.
4. The apparatus of claim 1 wherein the valve actuator means (180,188) comprises a timing disk (180) rotatably mounted on the door (120), and a timing arm (188) carried on the timing disk (180) to engage and rotate the valve operators (138) to selectively move the valves (136) between closed and open positions.
5. The apparatus of claim 4 wherein the valve actuator means (180,188) further comprises sensor means (182) carried on the door (120) for sensing the position of the timing disk (180) and for sending a position signal in response thereto.
6. The apparatus of claim 5 wherein the valve actuator means (180,188) further comprises a motor (174) carried on the door (120) and drivingly engaging the timing disk (180), the motor (174) responsive to the position signal to control movement of the timing disk (180).
7. The apparatus of claim 6 wherein the door (120) lies in a plane and the motor (174) is mounted to a mounting plate (166) extending at an acute angle to the plane.

8. The apparatus of claim 1 wherein the movable platform (74) contains material attracted by a magnet, the apparatus further comprising magnet means (248) mounted on the frame (70), adjacent the platform (74), the magnet means (248) selectively operable to selectively attract the platform (74) to impede movement of the platform (74) so as to guide the presentation of preselected ones of the plurality of canisters (72) to the dispensing station (240). 5
9. The apparatus of claim 8 wherein the magnet means (248) is located adjacent the dispensing station (240) and when operated, engages the platform (74) to support the platform (74) against dislocation forces caused by the pump actuator means (200,206) as the pump operators (132,134) are actuated to selectively withdraw and dispense preselected amounts of materials from the canisters (72). 10
10. The apparatus of claim 9 wherein the platform (74) is mounted for rotation about an axis, the pump operator (132,134) comprises a pump piston shaft (132) extending generally parallel to the axis and carries an outwardly extending protrusion (134), the pump actuator means (200,206) comprises a guide block (206) defining a groove (218) for receiving the protrusion (134) and means (204) for moving the guide block (206) generally parallel to the direction of the axis. 15
11. The apparatus of claim 10 wherein the platform comprises a turntable (74) in a generally horizontal plane, the magnet means (248) is located below the turntable (74) and when operated applies a force to the turntable (74) in a generally downward direction, and the piston shaft (132) is moved in a generally upward direction during operation of the metering pump (130). 20
12. The apparatus of claim 1 wherein at least one of the plurality of canisters (72) includes a stirring blade (76) mounted on a stirring rod (78) and the apparatus further includes a stir drive plate (84) carried on the platform (74), the stirring rod (78) engaging the stir drive plate (84). 25
13. The apparatus of claim 12 wherein the stir drive plate (84) comprises a plurality of outwardly projecting fingers (86), the fingers (86) defining apertures (90) for receiving respective ones of a plurality of the stirring rods (78). 30
14. The apparatus of claim 13 wherein the stir drive plate (84) comprises a centrally located hole (106) and the apparatus further comprises a stir drive arm (102,104) received in the centrally located hole (106) and means (94) for eccentrically rotating the stir drive arm (102,104). 35
15. The apparatus of claim 12 wherein the stir drive plate comprises a plurality of outwardly projecting fingers (86) carrying upwardly directed pins for engaging the stirring rods (78). 40
16. The apparatus of claim 15 wherein the stir drive plate (84) defines a pair of holes (106) and the apparatus further comprises a pair of stir drive arms (102) received in respective ones of the holes (106) and means (94) for eccentrically rotating the stir drive arms. 45
17. The apparatus of claim 16 wherein the means (94,114) for eccentrically rotating the stir drive arms (102) rotates the stir drive arms in synchronism. 50
18. The apparatus of claim 17 wherein the means (94,114) for eccentrically rotating the stir drive arms (102) includes a timing belt (114) engaging both stir drive arms (102), the means for eccentrically rotating the stir drive arms (102) including means (94) for driving the timing belt. 55
19. The apparatus of claim 1 wherein a housing (12) at least partly surrounds the canisters (72).
20. The apparatus of one of claims 8, 9 or 11 wherein a plurality of electromagnets are located immediately beneath the turntable (74).
21. The apparatus of claim 2 wherein:
- a first housing (12) at least partly surrounds the metering pumps (130) and valves (136) and defines a doorway opening,
- a second housing (14) defines an enclosed cavity, supports the first housing (12) from below, and contains drive means (94) for the movable platform (74);
- a door frame (46,18,20) is joined to the first housing (12) so as to surround the doorway opening, the door frame extending above the first housing; and
- a service door (120) is hingedly mounted to the door frame (46,18,20) so as to swing between closed and open positions, toward and away from the canisters (72).
22. The apparatus of claim 21 wherein the second housing (14) comprises a plurality of wall assemblies, the wall assemblies comprising an internal wall frame (38,40,42) having an open central portion, and outer panels (50,52,54) releasably attached to the wall frame.
23. The apparatus of claim 22 wherein at least one outer panel (50,52, or 54) is secured to the wall frame (38,40,42) with hook and loop fastener material.

Patentansprüche

1. Ausgabevorrichtung (10) zum Ausgeben von mehreren feinpulvigen Materialien mit:

mehreren Kanistern (72) zum Lagern von auszugebenden Materialien; einer Ausgabestation (240), an welcher die Materialien ausgegeben werden; mehreren Messpumpen (130), jeweils einem der mehreren Kanister (72) zugeordnet, um Materialien von dem Kanister zu erhalten, wobei die Dosierpumpen (130) Pumpenbetreiber (132, 134) zum Ausgeben von vorbestimmten Mengen von Materialien beinhalten, welche aus den Kanistern (72) abgezogen werden; einer beweglichen Plattform (74) zum Lagern der mehreren Kanister (72) und um ausgewählte der mehreren Kanister (72) der Ausgabestation (240) darzubieten; einem Rahmen (36), welcher die Plattform (74) lagert; Pumpenbetätigungsmittern (200, 206) für einen Eingriff mit den Pumpenbetreibern (132, 134) und zum Betätigen der Pumpenbetreiber (132, 134), um vorbestimmte Mengen von Materialien von den Kanistern (72) abzuziehen und auszugeben;

dadurch gekennzeichnet, dass

eine Tür (120) an der Ausgabestation (240) mittels des Rahmens (36, 18) schwenkbar gelagert ist; und dass das Pumpenbetätigungsmittel (200, 206) an der Tür (120) angebracht ist.

2. Vorrichtung nach Anspruch 1, weiter mit mehreren Ventilen (136), welche jeweils einem der mehreren Kanister (72) zugeordnet sind, um den Strom der Materialien von den Kanistern zu steuern, wobei die Ventile (136) Ventilbetreiber (138) zum Bewegen der Ventile (136) zwischen einer offenen und einer geschlossenen Position beinhalten.

3. Vorrichtung nach Anspruch 1, weiter mit Ventilbetätigungsmittern (180, 188), welche an der Tür (120) angebracht sind, für einen Eingriff mit den Ventilbetreibern (138), um die Ventile (136) selektiv zwischen einer offenen und einer geschlossenen Position zu bewegen.

4. Vorrichtung nach Anspruch 1, wobei das Ventilbetätigungsmittel (180, 188) eine Takscheibe (180) aufweist, welche drehbar an der Tür (120) angebracht ist, und einen Taktarm (188), welcher an der Takscheibe (180) angebracht ist, um mit den Ventilbetreibern (138) in Eingriff zu geraten und diese zu drehen, um die Ventile (136) zwischen einer geschlossenen und einer offenen Position selektiv zu bewegen.

5. Vorrichtung nach Anspruch 4, wobei das Ventilbetätigungsmittel (180, 188) weiter Sensormittel (182) aufweist, welche an der Tür (120) angebracht sind zum Erfassen der Position der Takscheibe (180) und zum Aussenden eines Positionssignals als Antwort darauf.

6. Vorrichtung nach Anspruch 5, wobei das Ventilbetätigungsmittel (180, 188) weiter einen Motor (174) aufweist, welcher an der Tür (120) angebracht ist und mit der Takscheibe (180) antreibend in Eingriff ist, wobei der Motor (174) auf das Positionssignal antwortet, um die Bewegung der Takscheibe (180) zu steuern.

7. Vorrichtung nach Anspruch 6, wobei die Tür (120) in einer Ebene liegt und der Motor (174) an einer Anbringplatte (166) angebracht ist, welche sich in einem spitzen Winkel zu dieser Ebene erstreckt.

8. Vorrichtung nach Anspruch 1, wobei die bewegliche Plattform (74) Material beinhaltet, welches durch einen Magneten angezogen wird, wobei die Vorrichtung weiter Magnetmittel (248) aufweist, welche an dem Rahmen (70) angrenzend an die Plattform (74) angebracht sind; wobei die Magnetmittel (248) selektiv betätigbar sind, um die Plattform (74) selektiv anzuziehen, um die Bewegung der Plattform (74) zu hindern, um die Darbietung von vorbestimmten der mehreren Kanister (72) an die Ausgabestation (240) zu führen.

9. Vorrichtung nach Anspruch 8, wobei das Magnetmittel (248) angrenzend an die Ausgabestation (240) vorgesehen ist und, wenn es betätigt wird, mit der Plattform (74) in Eingriff gerät, um die Plattform (74) gegen Verschiebungskräfte zu lagern, welche durch das Pumpenbetätigungsmittel (200, 206) verursacht werden, wenn die Pumpenbetreiber (132, 134) betätigt werden, um selektiv vorbestimmte Mengen von Materialien von den Kanistern (72) abzuziehen und auszugeben.

10. Vorrichtung nach Anspruch 9, wobei die Plattform (74) für eine Drehung um eine Achse herum angebracht ist, wobei der Pumpenbetreiber (132, 134) eine Pumpenkolbenwelle (132) aufweist, welche sich im Wesentlichen parallel zu der Achse erstreckt und einen nach außen sich erstreckenden Vorsprung (134) trägt, und wobei das Pumpenbetätigungsmittel (200, 206) einen Führungsblock (206) aufweist, welcher eine Nut (218) für die Aufnahme des Vorsprungs (134) definiert, sowie Mittel (204) zum Bewegen des Führungsblocks (206) im Wesentlichen parallel zur Richtung der Achse.

11. Vorrichtung nach Anspruch 10, wobei die Plattform einen Drehtisch (74) in einer im Wesentlichen hori-

- zontalen Ebene aufweist, wobei das Magnetmittel (248) unterhalb des Drehtisches (74) angeordnet ist und, wenn es betätigt wird, eine Kraft auf den Drehtisch (74) im Wesentlichen nach unten ausübt, und wobei die Kolbenwelle (132) im Wesentlichen nach oben bewegt wird während des Betriebs der Dosierpumpe (130).
12. Vorrichtung nach Anspruch 1, wobei zumindest einer der mehreren Kanister (72) eine Rührschaufel (76) beinhaltet, welche an einer Rührstange (78) angebracht ist, und wobei die Vorrichtung weiter eine Rührantriebsplatte (84) beinhaltet, welche auf der Plattform (74) angebracht ist, wobei die Rührstange (78) in Eingriff mit der Rührantriebsplatte (84) ist.
13. Vorrichtung nach Anspruch 12, wobei die Rührantriebsplatte (84) mehrere nach außen vorstehende Finger (86) aufweist, wobei die Finger (86) Öffnungen (90) zur Aufnahme von jeweils einer der mehreren Rührstangen (78) definieren.
14. Vorrichtung nach Anspruch 13, wobei die Rührantriebsplatte (84) eine mittig angeordnete Platte (106) aufweist und wobei die Vorrichtung weiter einen Rührantriebsarm (102, 104) aufweist, welcher in der mittig angeordneten Öffnung (106) aufgenommen ist, sowie Mittel (94) zum exzentrischen Drehen des Rührantriebsarms (102, 104).
15. Vorrichtung nach Anspruch 12, wobei die Rührantriebsplatte mehrere nach außen vorstehende Finger (86) aufweist, welche nach oben gerichtete Stifte für einen Eingriff mit den Rührstangen (78) tragen.
16. Vorrichtung nach Anspruch 15, wobei die Rührantriebsplatte (84) ein Paar von Öffnungen (106) definiert und wobei die Vorrichtung weiter ein Paar von Rührantriebsarmen (102) aufweist, welche in jeweils einer der Öffnungen (106) aufgenommen sind, sowie Mittel (94) zum exzentrischen Drehen des Rührantriebsarms.
17. Vorrichtung nach Anspruch 16, wobei das Mittel (94, 114) zum exzentrischen Drehen der Rührantriebsarme (102) die Rührantriebsarme synchron dreht.
18. Vorrichtung nach Anspruch 17, wobei das Mittel (94, 114) zum exzentrischen Drehen der Rührantriebsarme (102) einen Synchronriemen (114) beinhaltet, welcher mit beiden Rührantriebsarmen (102) im Eingriff ist, wobei das Mittel zum exzentrischen Drehen der Rührantriebsarme (102) Mittel (94) zum Antrieben des Synchronriemens beinhaltet.
19. Vorrichtung nach Anspruch 1, wobei ein Gehäuse (12) die Kanister (72) zumindest teilweise umgibt.
20. Vorrichtung nach einem der Ansprüche 8, 9 oder 11, wobei mehrere Elektromagneten unmittelbar unterhalb des Drehtisches (74) angeordnet sind.
21. Vorrichtung nach Anspruch 2, wobei:
- ein erstes Gehäuse (12) zumindest teilweise die Dosierpumpen (130) und Ventile (136) umgibt und eine Türöffnung definiert,
 - ein zweites Gehäuse (14) einen geschlossenen Hohlraum definiert, das erste Gehäuse (12) von unten lagert und Antriebsmittel (94) für die bewegliche Plattform (74) aufweist;
 - ein Türrahmen (46, 18, 20) mit dem ersten Gehäuse (12) so verbunden ist, dass er die Türöffnung umgibt, wobei sich der Türrahmen oberhalb des ersten Gehäuses erstreckt; und
 - eine Servicetür (120) schwenkbar an dem Türrahmen (46, 18, 20) angebracht ist, um zwischen einer geschlossenen und einer offenen Position zu schwingen, und zwar zu den Kanistern (72) hin und weg von den Kanistern (72).
22. Vorrichtung nach Anspruch 21, wobei das zweite Gehäuse (14) mehrere Wandanordnungen aufweist, wobei die Wandanordnungen einen inneren Wandrahmen (38, 40, 42) aufweisen mit einem offenen mittleren Bereich sowie äußere Tafeln (50, 52, 54), welche lösbar an dem Wandrahmen angebracht sind.
23. Vorrichtung nach Anspruch 22, wobei zumindest eine äußere Tafel (50, 52 oder 54) an dem Wandrahmen (38, 40, 42) mit Hakenband-Befestigungsmaterial angebracht ist.

Revendications

1. Appareil de distribution (10) pour distribuer une pluralité de matériaux en poudre, comprenant:
- une pluralité de bidons (72) pour conserver des matériaux à distribuer;
 - un poste de distribution (240) où les matériaux sont distribués;
 - une pluralité de pompes doseuses (130) associées à des bidons respectifs de la dite pluralité de bidons (72), pour recevoir des matériaux de ceux-ci, les pompes doseuses (130) comprenant des opérateurs de pompe (132, 134) pour distribuer des quantités prédéterminées de ma-

- tériaux extraits des bidons (72); une plate-forme mobile (74) pour soutenir la pluralité des bidons (72), et pour présenter au poste de distribution (240) des bidons présélectionnés parmi la pluralité de bidons (72); un bâti (36) soutenant la plate-forme (74); des moyens d'actionnement de pompe (200, 206), pour venir en engagement avec les opérateurs de pompe (132, 134) et pour actionner les opérateurs de pompe (132, 134) de façon à extraire et à distribuer sélectivement des quantités présélectionnées de matériaux des bidons (72);
- caractérisé en ce que**
- une porte (120) est articulée sur le bâti (36, 18) au poste de distribution (240); et les moyens d'actionnement de pompe (200, 206) sont portés par la porte (120).
2. Appareil selon la revendication 1, comprenant en outre une pluralité de vannes (136) associées à des bidons respectifs parmi la dite pluralité de bidons (72), pour commander le flux de matériaux provenant de ceux-ci, les vannes (136) comprenant des opérateurs de vanne (138) pour déplacer les vannes (136) entre une position fermée et une position ouverte.
3. Appareil selon la revendication 1, comprenant en outre des moyens d'actionnement de vanne (180, 188) portés par la porte (120), pour entrer en engagement avec les opérateurs de vanne (138) de façon à déplacer sélectivement les vannes (136) entre une position fermée et une position ouverte.
4. Appareil selon la revendication 1, dans lequel les moyens d'actionnement de vanne (180, 188) comprennent un disque de distribution (180) monté à rotation sur la porte (120) et un bras de distribution (188) porté par le disque de distribution (180) pour venir en engagement avec, et faire tourner les opérateurs de vanne (138) de façon à déplacer sélectivement les vannes (136) entre une position fermée et une position ouverte.
5. Appareil selon la revendication 4, dans lequel les moyens d'actionnement de vanne (180, 188) comprennent en outre un moyen capteur (182) porté par la porte (120) pour détecter la position du disque de distribution (180), et pour envoyer un signal de position en réponse à cette détection.
6. Appareil selon la revendication 5, dans lequel les moyens d'actionnement de vanne (180, 188) comprennent en outre un moteur (174) porté par la porte (120) et engageant à entraînement le disque de distribution (180), le moteur (174) répondant au signal de position pour commander le déplacement du disque de distribution (180).
7. Appareil selon la revendication 6, dans lequel la porte (120) est située dans un plan, et le moteur (174) est monté sur un plateau de montage (166) s'étendant suivant un angle aigu par rapport au plan.
8. Appareil selon la revendication 1, dans lequel la plate-forme mobile (74) contient un matériau attiré par un aimant, l'appareil comprenant en outre un moyen magnétique (248) monté sur le bâti (70) dans une position adjacente à la plate-forme (74), le moyen magnétique (248) pouvant être actionné sélectivement pour attirer sélectivement la plate-forme (74) pour conférer à la plate-forme (74) un déplacement de façon à guider la présentation de bidons présélectionnés parmi la pluralité de bidons (72) au poste de distribution (240).
9. Appareil selon la revendication 8, dans lequel le moyen magnétique (248) est situé en position adjacente au poste de distribution (240) et, lorsqu'il est actionné, il vient en engagement avec la plate-forme (74) pour soutenir la plate-forme (74) face aux forces de délogement provoquées par les moyens d'actionnement de pompe (200, 206) lorsque les opérateurs de pompe (132, 134) sont actionnés pour extraire et distribuer sélectivement des quantités présélectionnées de matériaux provenant des bidons (72).
10. Appareil selon la revendication 9, dans lequel la plate-forme (74) est montée à rotation autour d'un axe, l'opérateur de pompe (132, 134) comprend une tige de piston de pompe (132) s'étendant généralement parallèlement à l'axe, et porte une saillie (134) débordant vers l'extérieur, les moyens d'actionnement de pompe (200, 206) comprennent un bloc de guidage (206) définissant une rainure (218) pour recevoir la saillie (134) et un moyen (204) pour déplacer le bloc de guidage (206) de façon généralement parallèle à la direction de l'axe.
11. Appareil selon la revendication 10, dans lequel la plate-forme comprend une table tournante (74) dans un plan généralement horizontal, le moyen magnétique (248) est situé en dessous de la table tournante (74) et, lorsqu'il est actionné, exerce une force sur la table tournante (74) dans une direction dirigée généralement vers le bas, et la tige de piston (132) est déplacée dans une direction allant généralement vers le haut pendant le fonctionnement de la pompe doseuse (130).
12. Appareil selon la revendication 1, dans lequel au moins un bidon parmi la pluralité de bidons (72)

- comprend une pale de brassage (76) montée sur une tige de brassage (78), et l'appareil comprend en outre un plateau (84) d'entraînement de brassage porté sur la plate-forme (74), la tige de brassage (78) venant en engagement avec le plateau (84) d'entraînement de brassage.
13. Appareil selon la revendication 12, dans lequel le plateau (84) d'entraînement de brassage comprend une pluralité de doigts (86) débordant vers l'extérieur, les doigts (86) définissant des ouvertures (90) pour recevoir des tiges de brassage respectives parmi la pluralité de tiges de brassage (78).
14. Appareil selon la revendication 13, dans lequel le plateau (84) d'entraînement de brassage comprend un trou (106) situé au centre, et l'appareil comprend en outre un bras d'entraînement de brassage (102, 104) reçu dans le trou central (106), et un moyen (94) pour faire tourner excentriquement le bras (102, 104) d'entraînement de brassage.
15. Appareil selon la revendication 12, dans lequel le plateau d'entraînement de brassage comprend une pluralité de doigts (86), débordant vers l'extérieur, portant des goujons dirigés vers le haut pour venir en engagement avec les tiges de brassage (78).
16. Appareil selon la revendication 15, dans lequel le plateau (84) d'entraînement de brassage définit une paire de trous (106), et l'appareil comprend en outre une paire de bras d'entraînement de brassage (102) reçus dans des trous respectifs parmi les trous (106), et un moyen (94) pour faire tourner excentriquement les bras d'entraînement de brassage.
17. Appareil selon la revendication 16, dans lequel le moyen (94, 114) pour faire tourner excentriquement les bras d'entraînement de brassage (102) fait tourner les bras d'entraînement de brassage de manière synchronisée.
18. Appareil selon la revendication 17, dans lequel le moyen (94, 114) pour faire tourner excentriquement les bras d'entraînement de brassage (102) comprend une courroie de distribution (114) qui engage les deux bras d'entraînement de brassage (102), le moyen pour faire tourner excentriquement les bras d'entraînement de brassage (102) comprenant un moyen (94) pour faire tourner la courroie de distribution.
19. Appareil selon la revendication 1, dans lequel un boîtier (12) entoure au moins en partie les bidons (72).
20. Appareil selon l'une des revendications 8, 9 et 11,
- dans lequel une pluralité d'électroaimants sont situés immédiatement en dessous de la table tournante (74).
- 5 21. Appareil selon la revendication 2, dans lequel:
- un premier boîtier (12) entoure au moins partiellement les pompes doseuses (130) et les vannes (136), et définit une ouverture de passage,
- 10 un deuxième boîtier (14) définit une cavité enclose, soutient le premier boîtier (12) depuis le bas, et contient un moyen d'entraînement (94) pour la plate-forme mobile (74);
- un encadrement de porte (46, 18, 20) est relié au premier boîtier (12) de manière à entourer l'ouverture de passage, l'encadrement de porte s'étendant au-dessus du premier boîtier; et
- 15 une porte de service (120) est articulée par charnières sur l'encadrement de porte (46, 18, 20) de manière à pivoter entre une position fermée et une position ouverte, pour s'approcher et s'écartier des bidons (72).
- 25 22. Appareil selon la revendication 21, dans lequel le deuxième boîtier (14) comprend une pluralité d'ensembles de parois, les ensembles de parois comprenant un encadrement de parois internes (38, 40, 42) présentant une partie centrale ouverte, et des panneaux extérieurs (50, 52, 54) reliés de façon libérable à l'encadrement de parois.
23. Appareil selon la revendication 22, dans lequel au moins un panneau extérieur (50, 52 ou 54) est fixé à l'encadrement de parois (38, 40, 42) par un matériau de fixation à crochet et boucle.

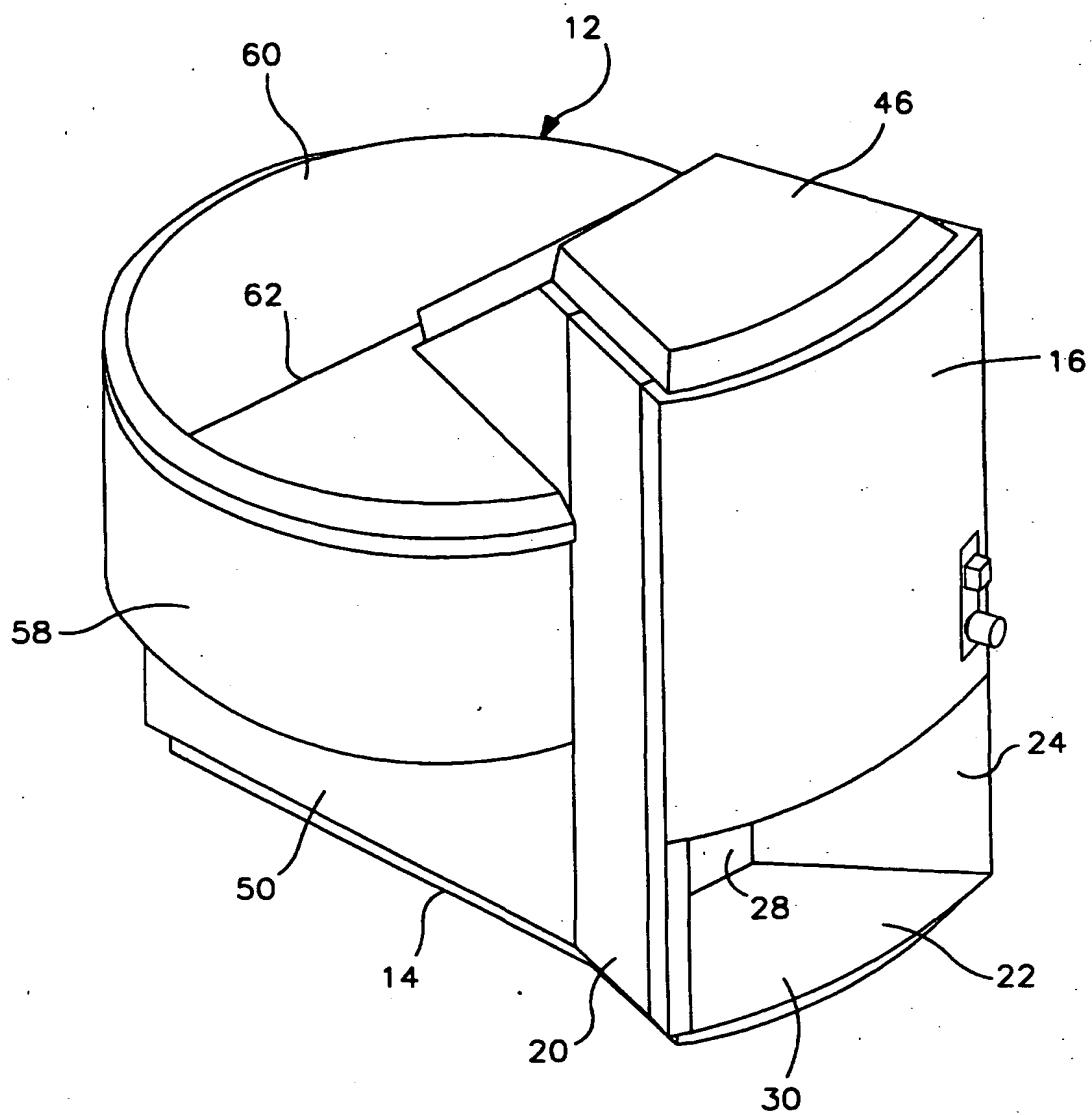


FIG. 1

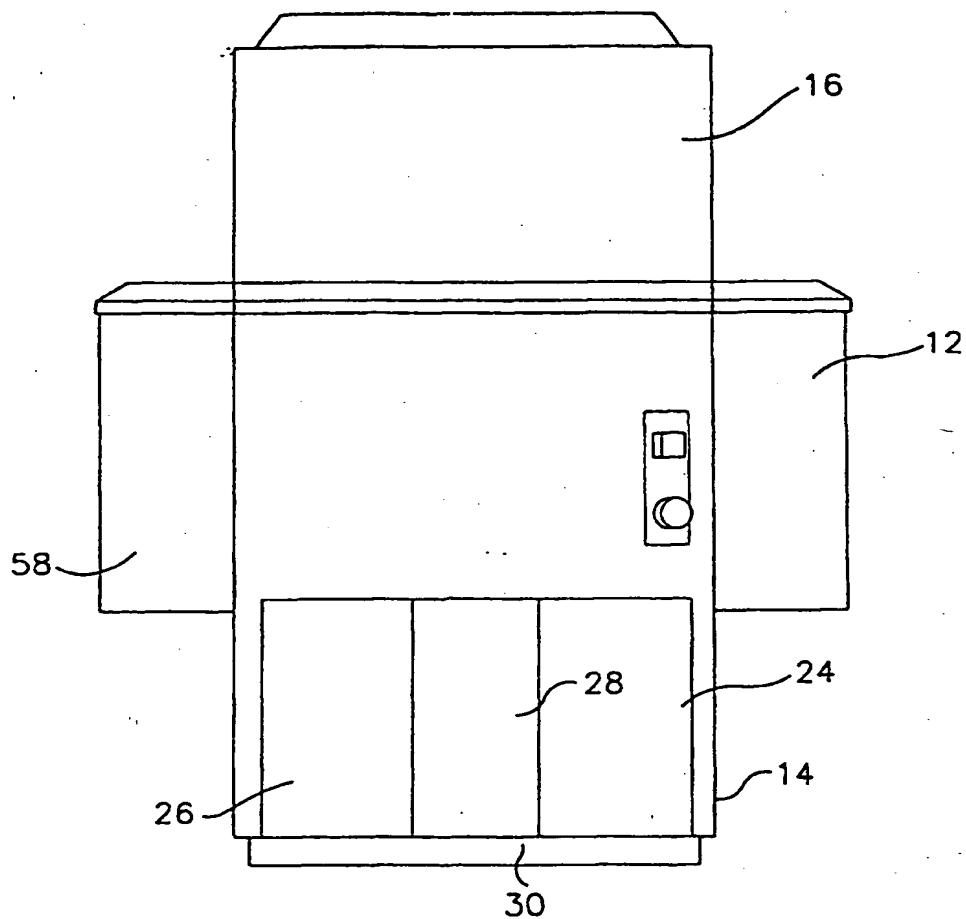


FIG. 2

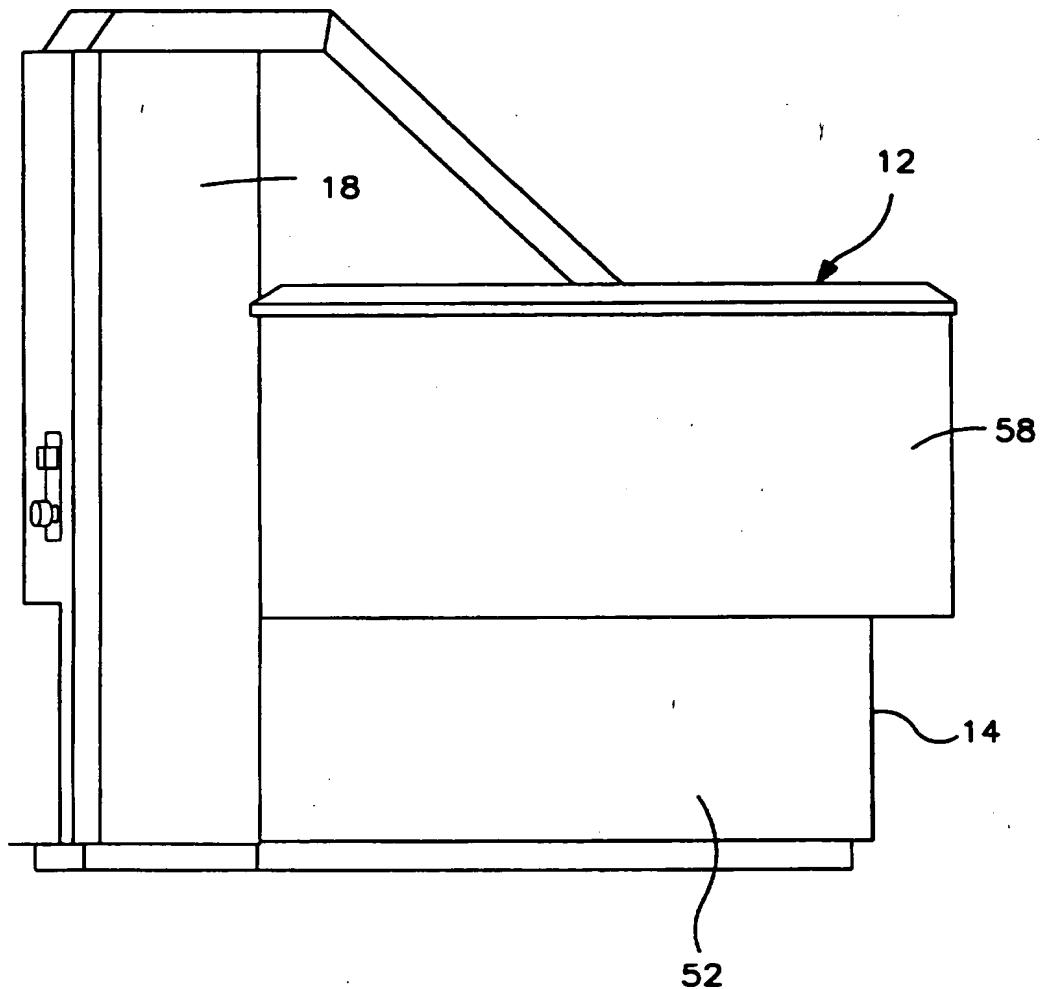


FIG. 3

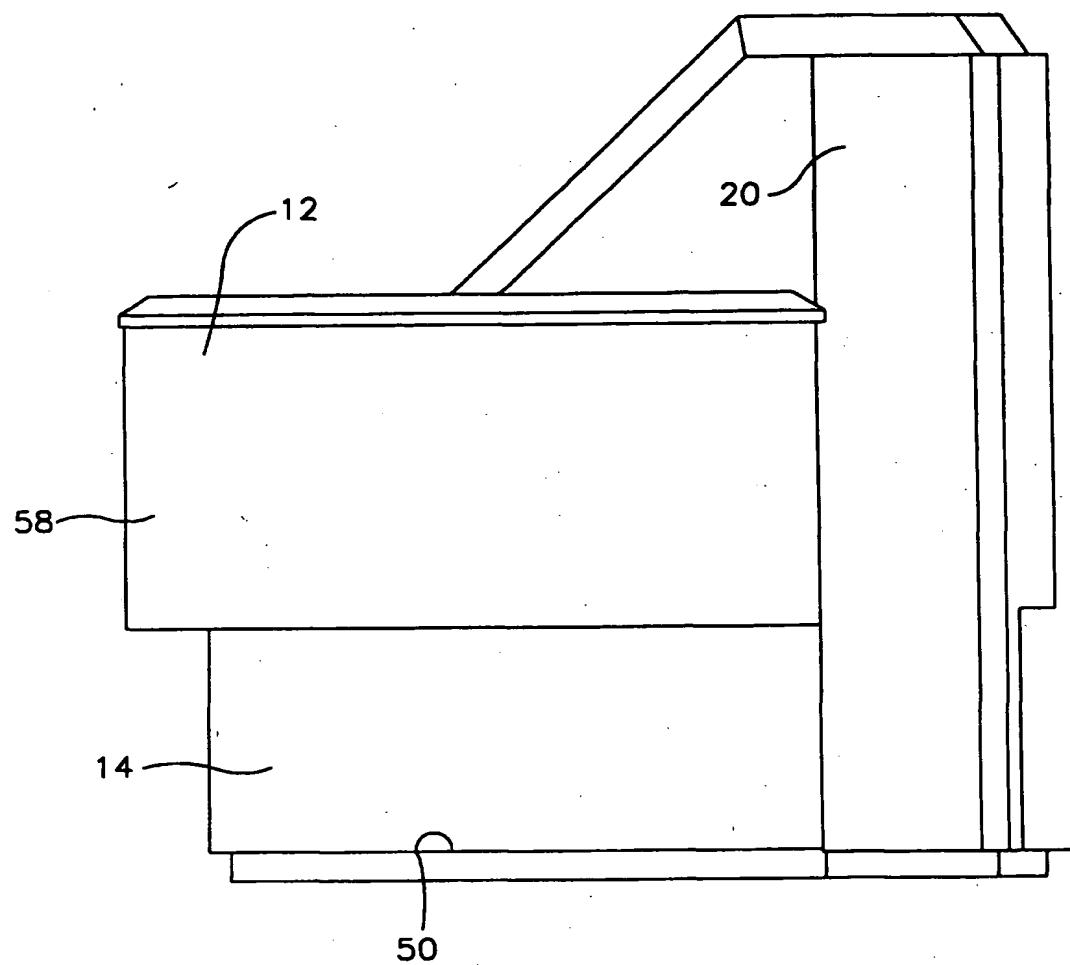


FIG. 4

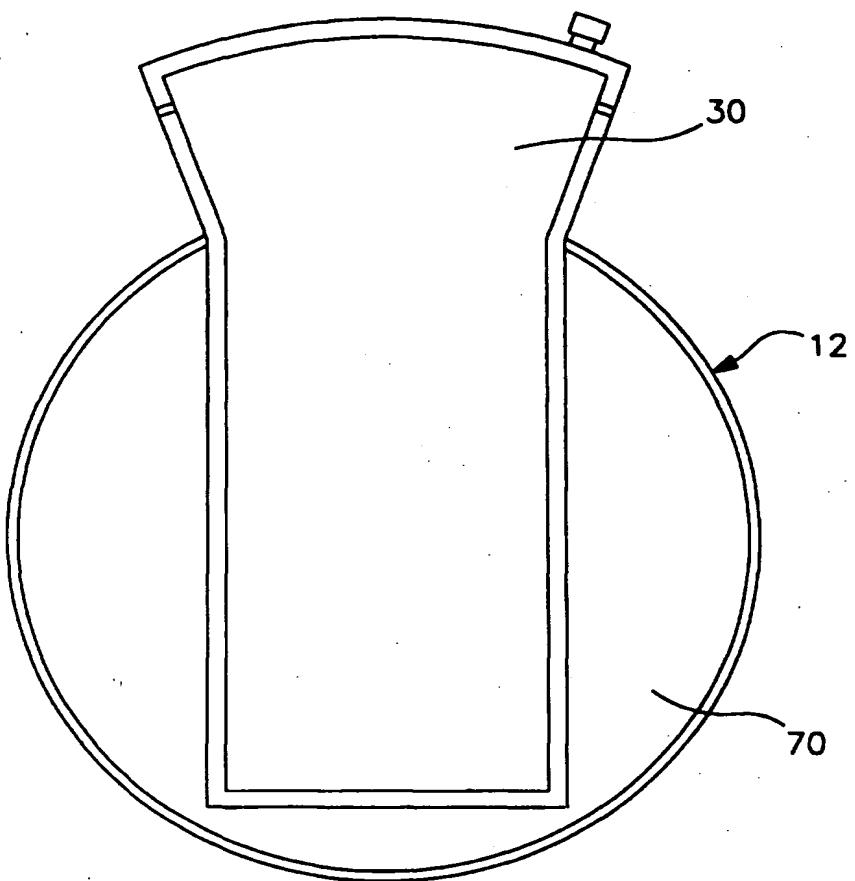


FIG. 5

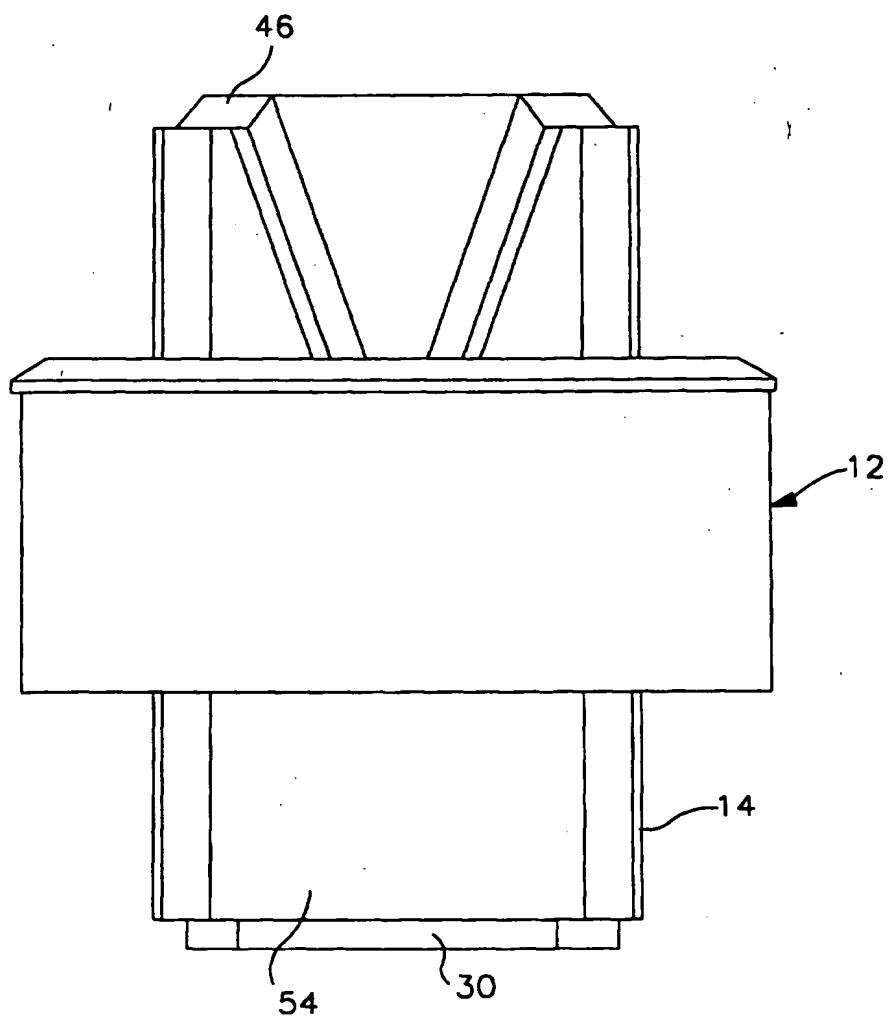


FIG. 6

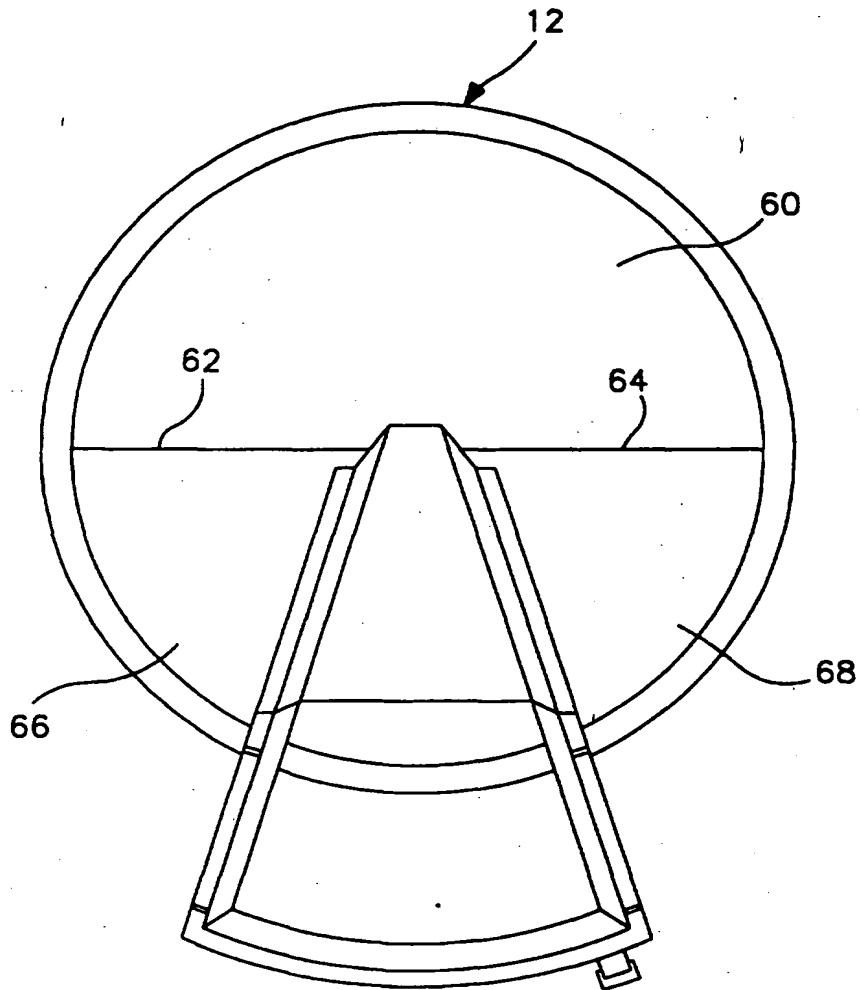


FIG. 7

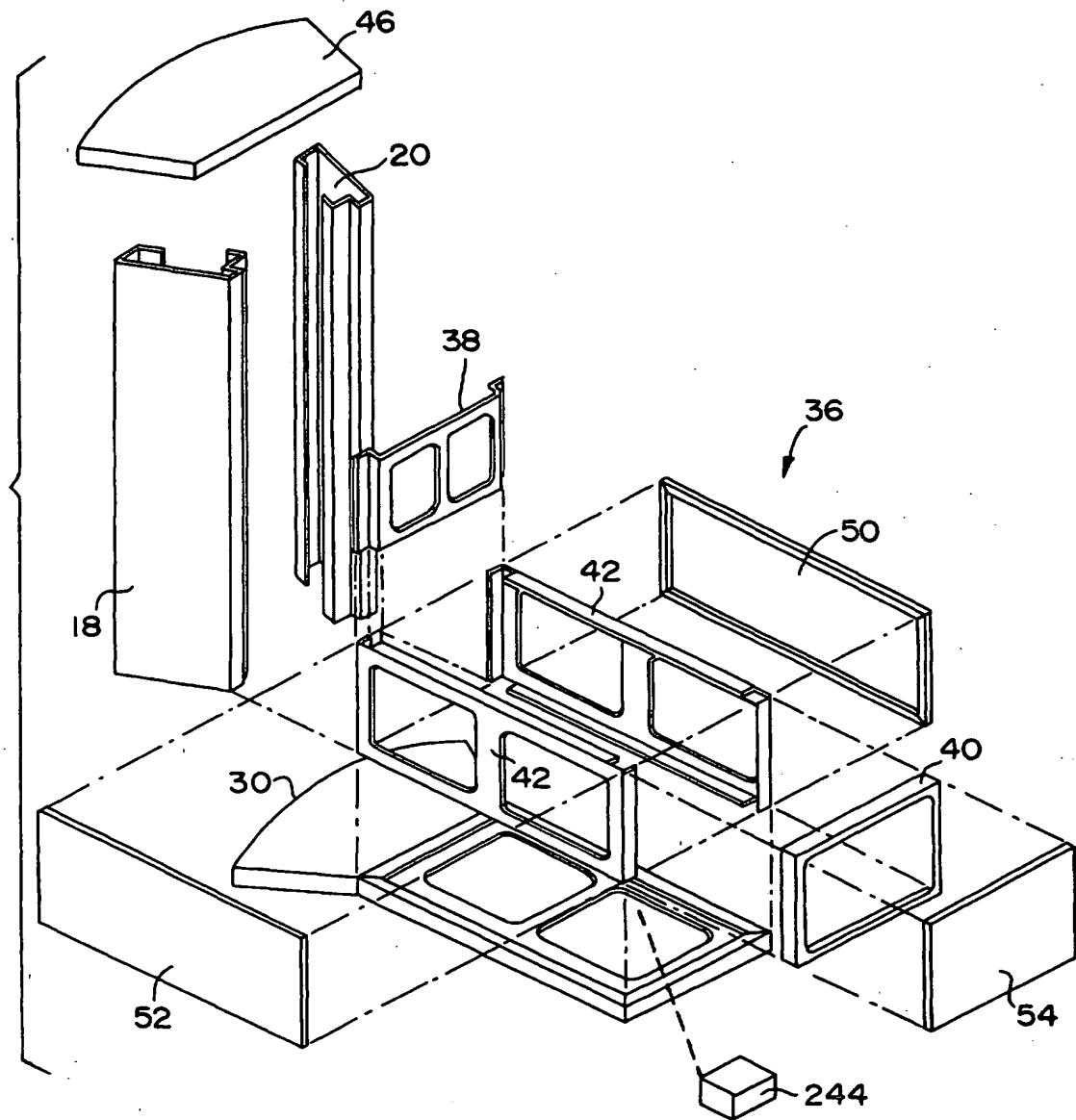


FIG. 8

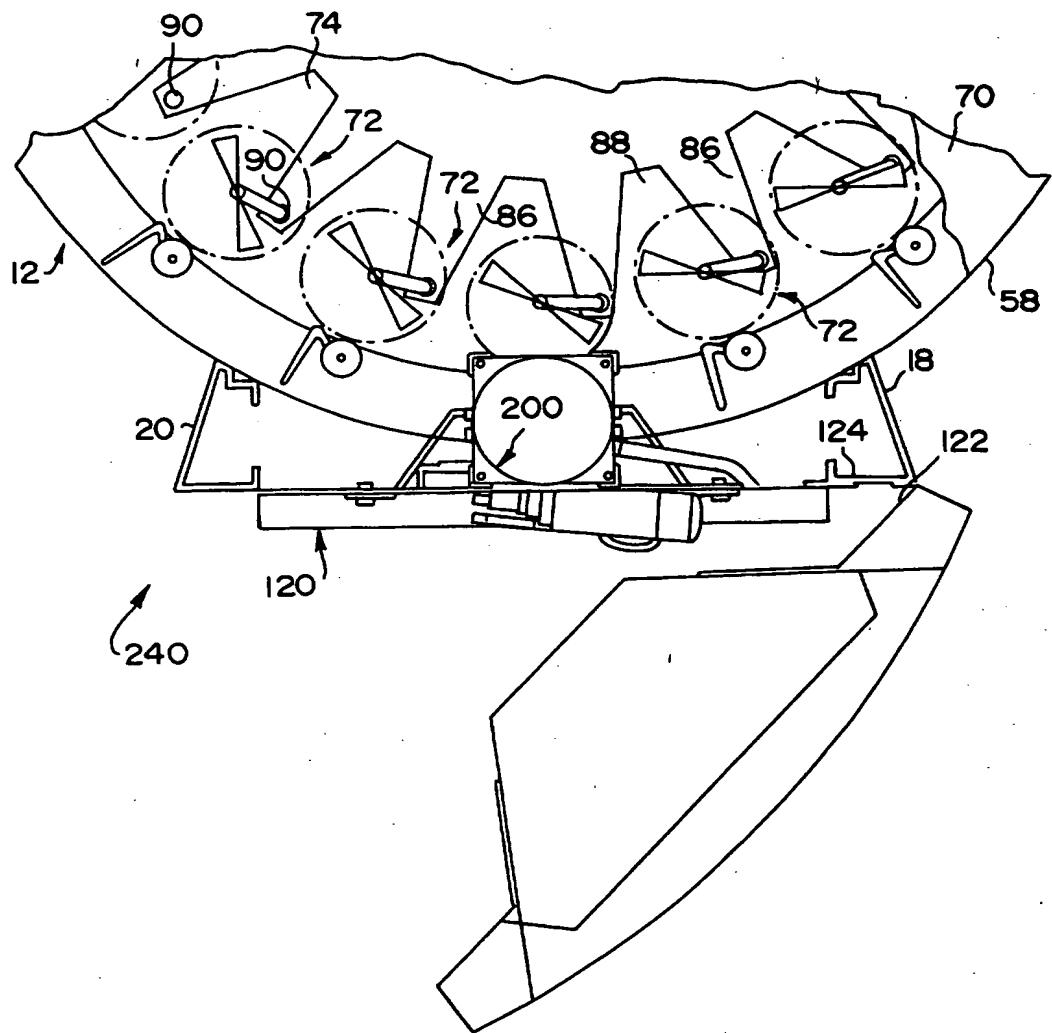


FIG. 9

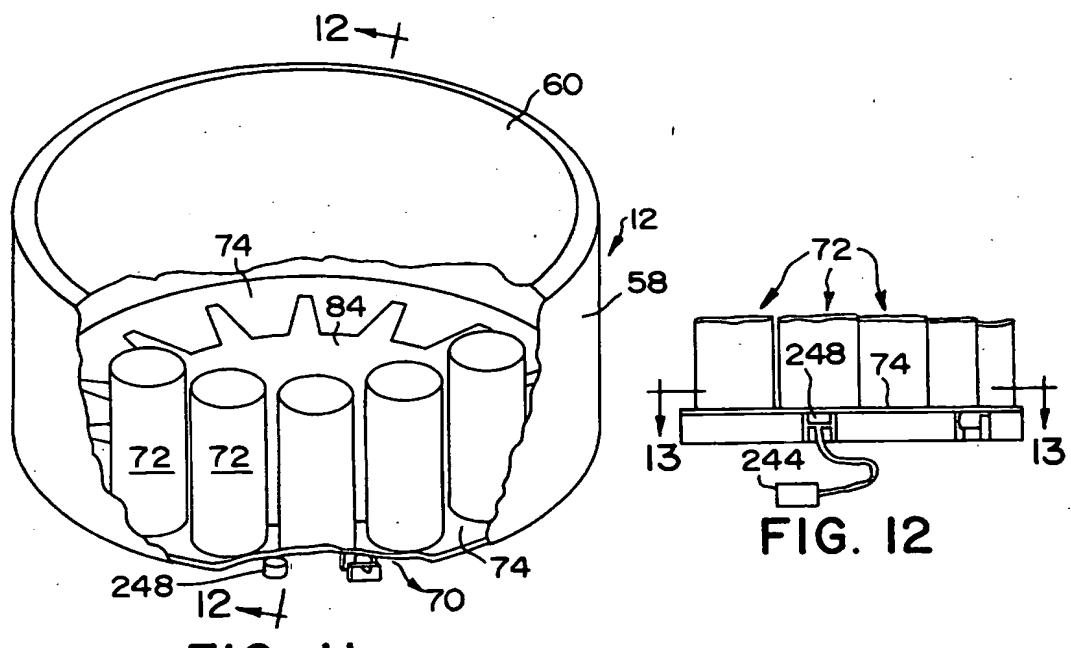
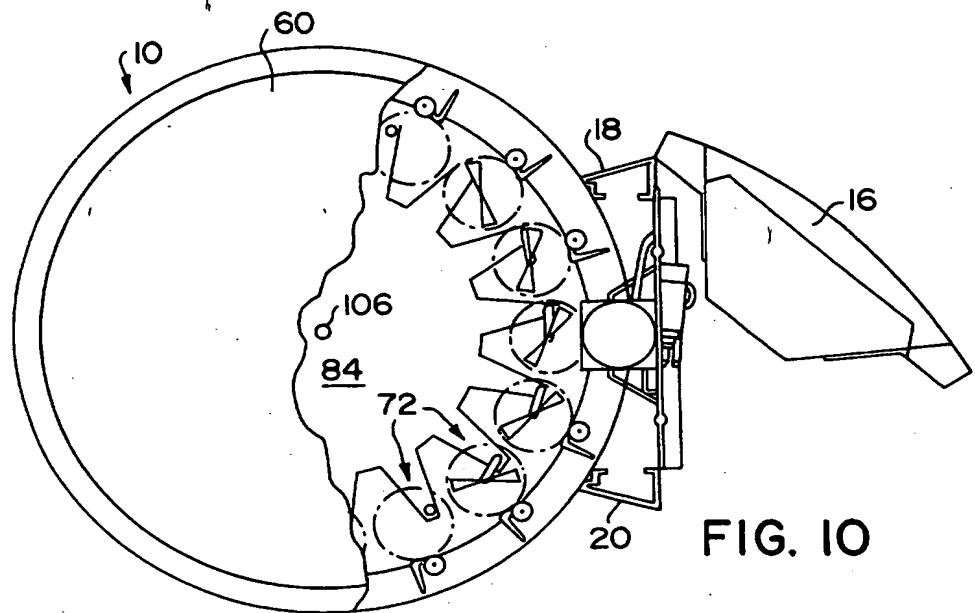


FIG. 11

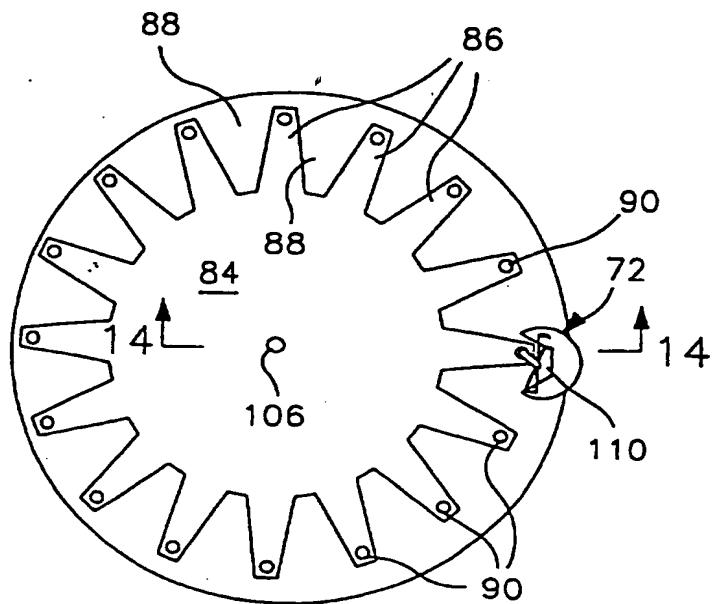


FIG. 13

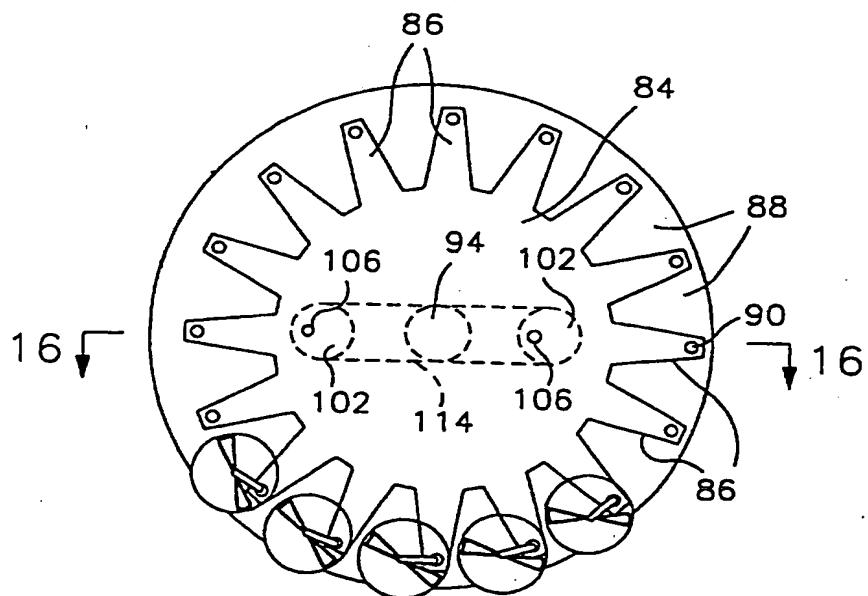


FIG. 15

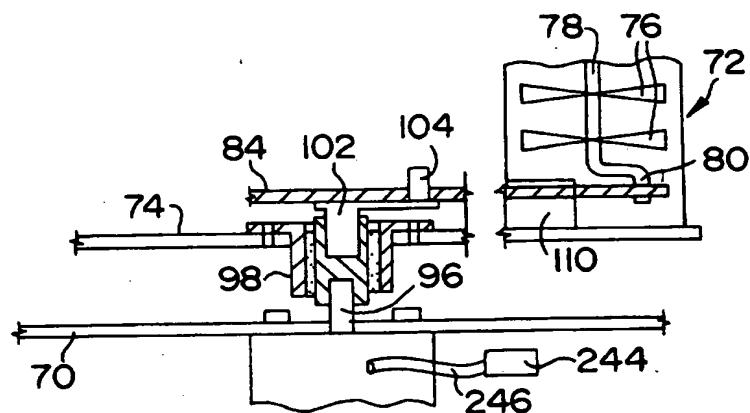


FIG. 14

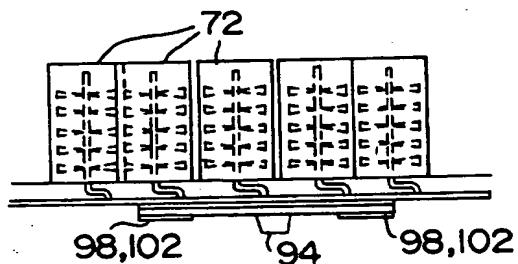


FIG. 16

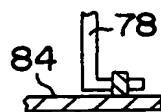
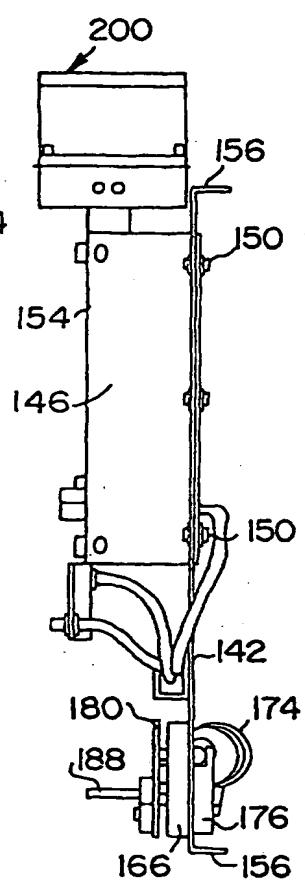
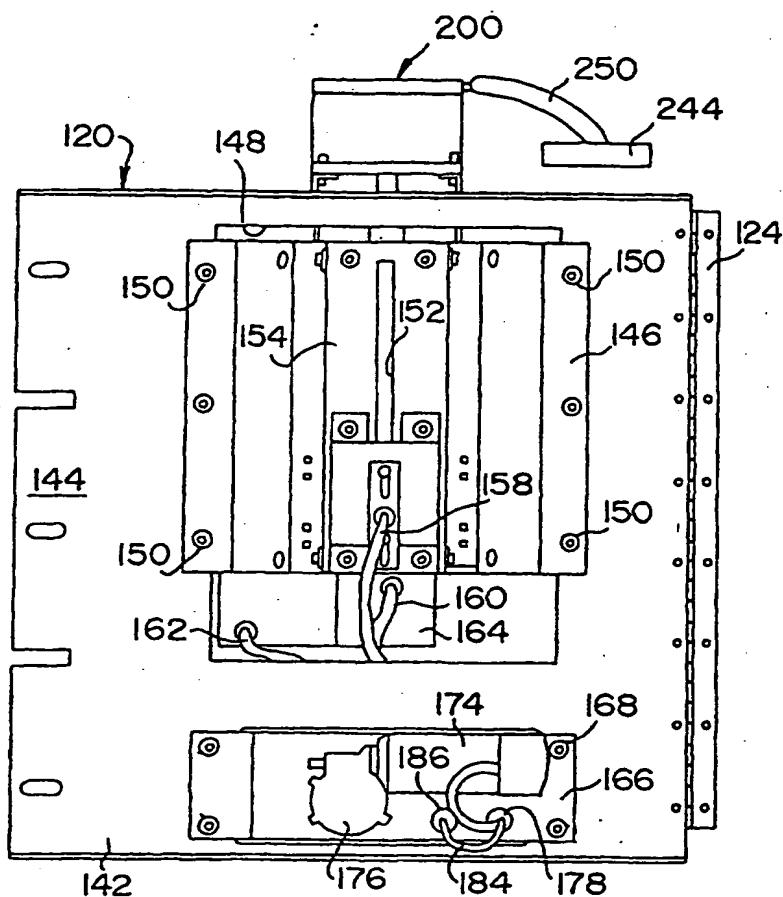


FIG. 16a



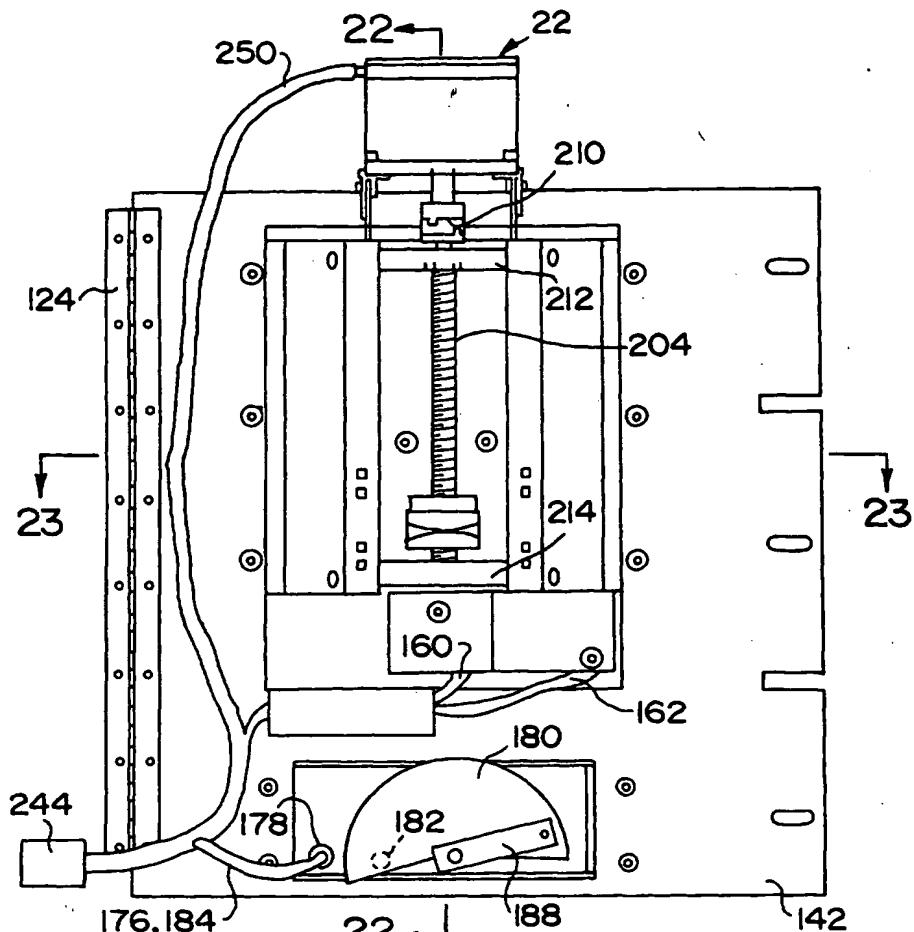


FIG. 19

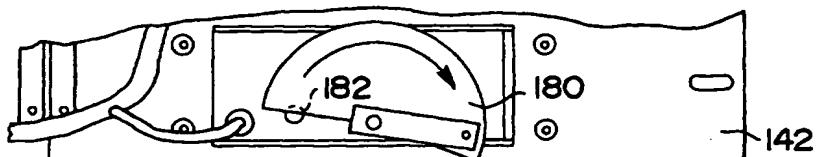


FIG. 20

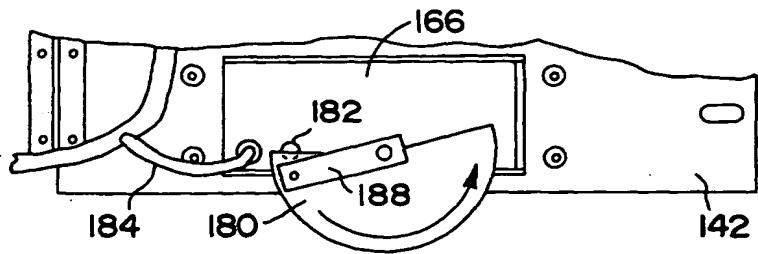


FIG. 21

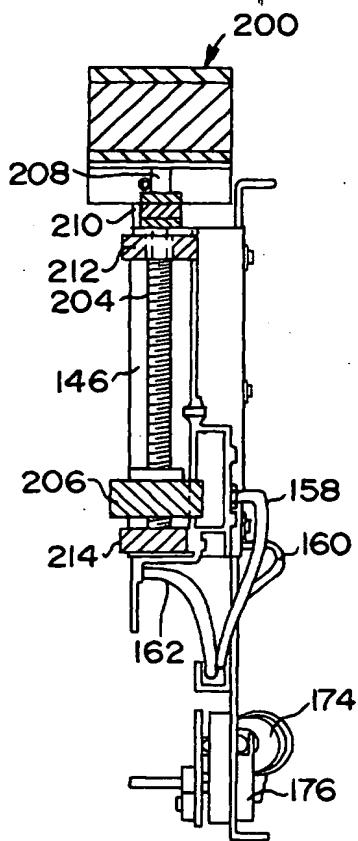


FIG. 22

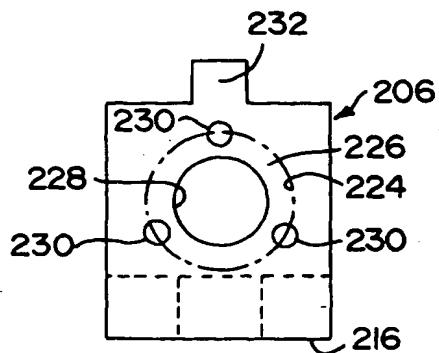


FIG. 26

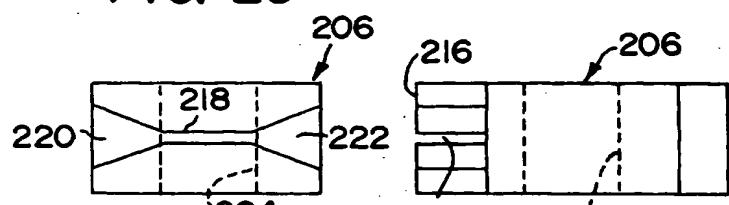


FIG. 24

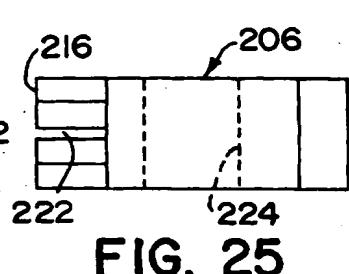


FIG. 25

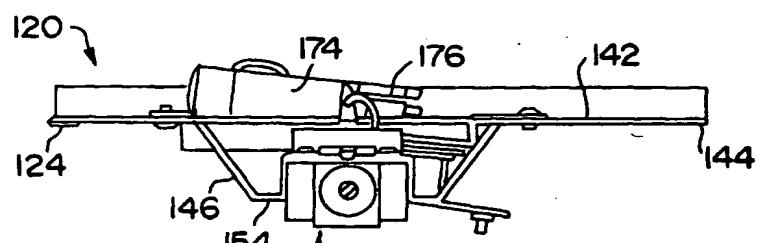


FIG. 23

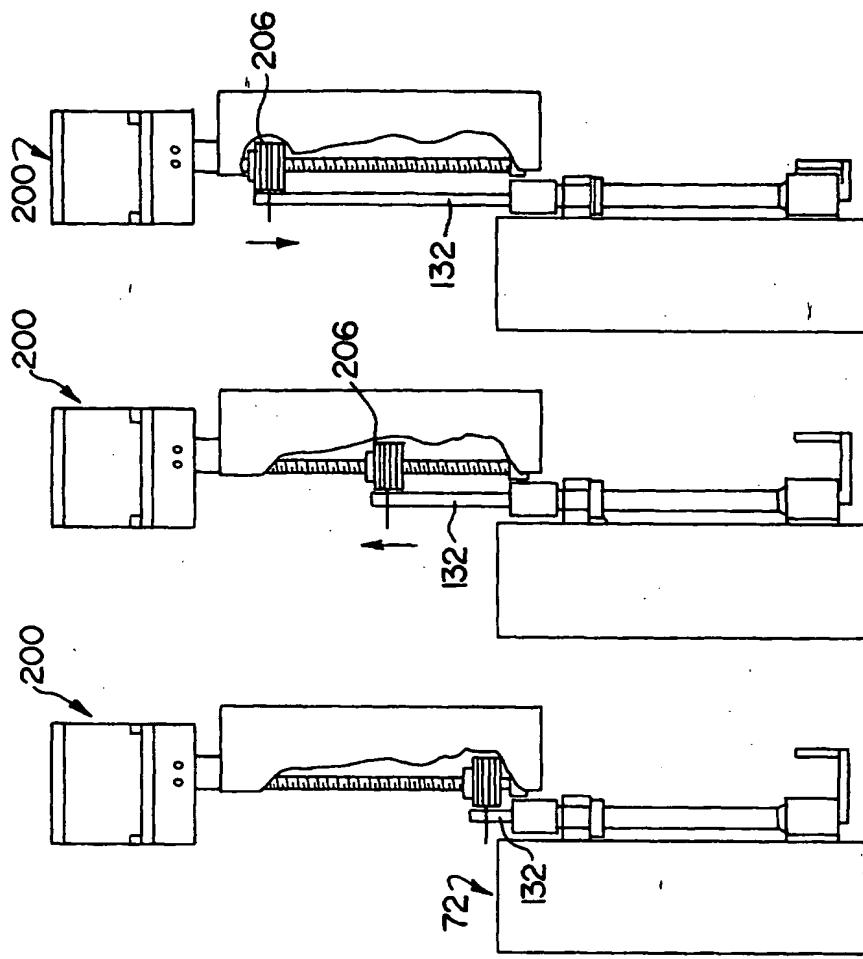


FIG. 30

FIG. 29

FIG. 28

FIG. 27

